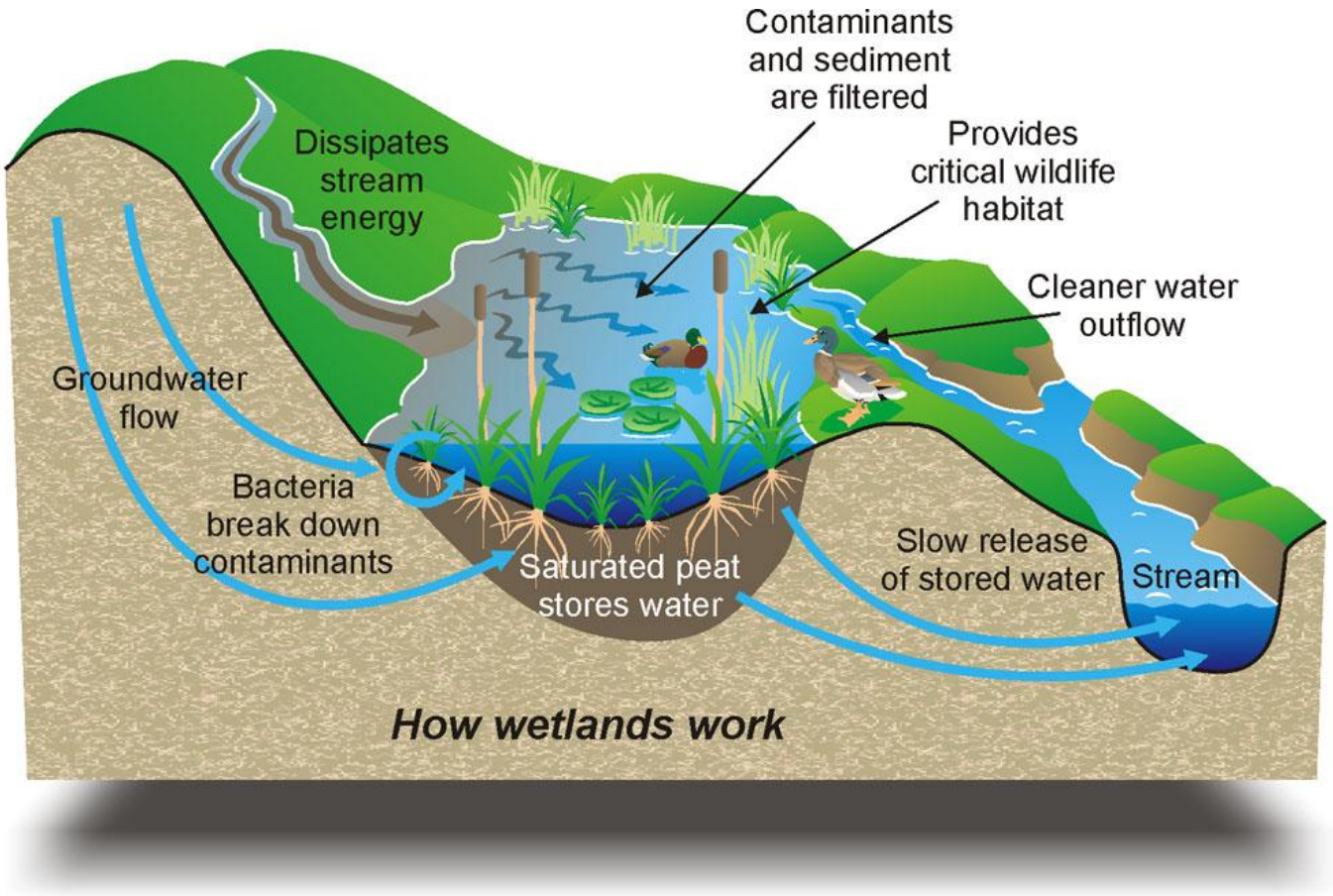
Assessing Wetland Functions for Regulatory Purposes

2012 BWSR Academy

Part 1 Outline

- Difference between functions and values
- Difference between wetland functional level and wetland condition
- How wetland functions and values are incorporated in WCA
- How functional assessments work
- Reference Wetland concept
- The MnRAM method

Wetland Functions – the things wetlands do



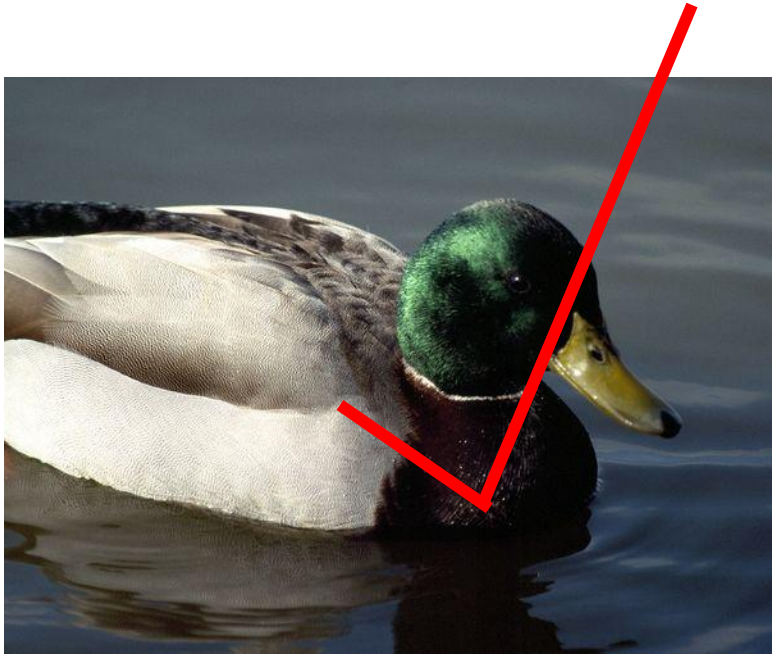
Functions

- Protect water quality
- Floodwater storage
- Wildlife habitat
- Shoreline protection
- Ecological processes
- Etc.

Uplands can perform these functions also, but usually in a different way or to a different degree.

Wetland Values

- The wetland functions that we consider important.
- We (society) place value on certain functions, but not others.



The Wetland Conservation Act says……

Public value of wetlands is based on their functions including:

- **Water quality**
- **Flood/storm water retention**
- **Recreation/education**
- **Commercial uses**
- **Fish, wildlife, native plant habitat**
- **Low-flow augmentation**
- **Functions identified in approved evaluation methods.**

The Wetland Conservation Act says……

Wetland replacement must replace the public value of wetlands lost.

Do we have to evaluate this each time an impact occurs?

No

<u>Replacement standards</u> in the rule generally help us replace function.

Big Picture View

However,

We sometimes need to evaluate function:

- **Prioritization of wetlands to avoid**
- **Applying sequencing flexibility**
- **Focusing wetland replacement efforts**
- **Raising replacement ratios**
- **Using ENRV or preservation for credit**
- **Comprehensive Wetland Mgmt Plans**

Functional Assessment

Evaluate functional level of a wetland in relation to other wetlands.

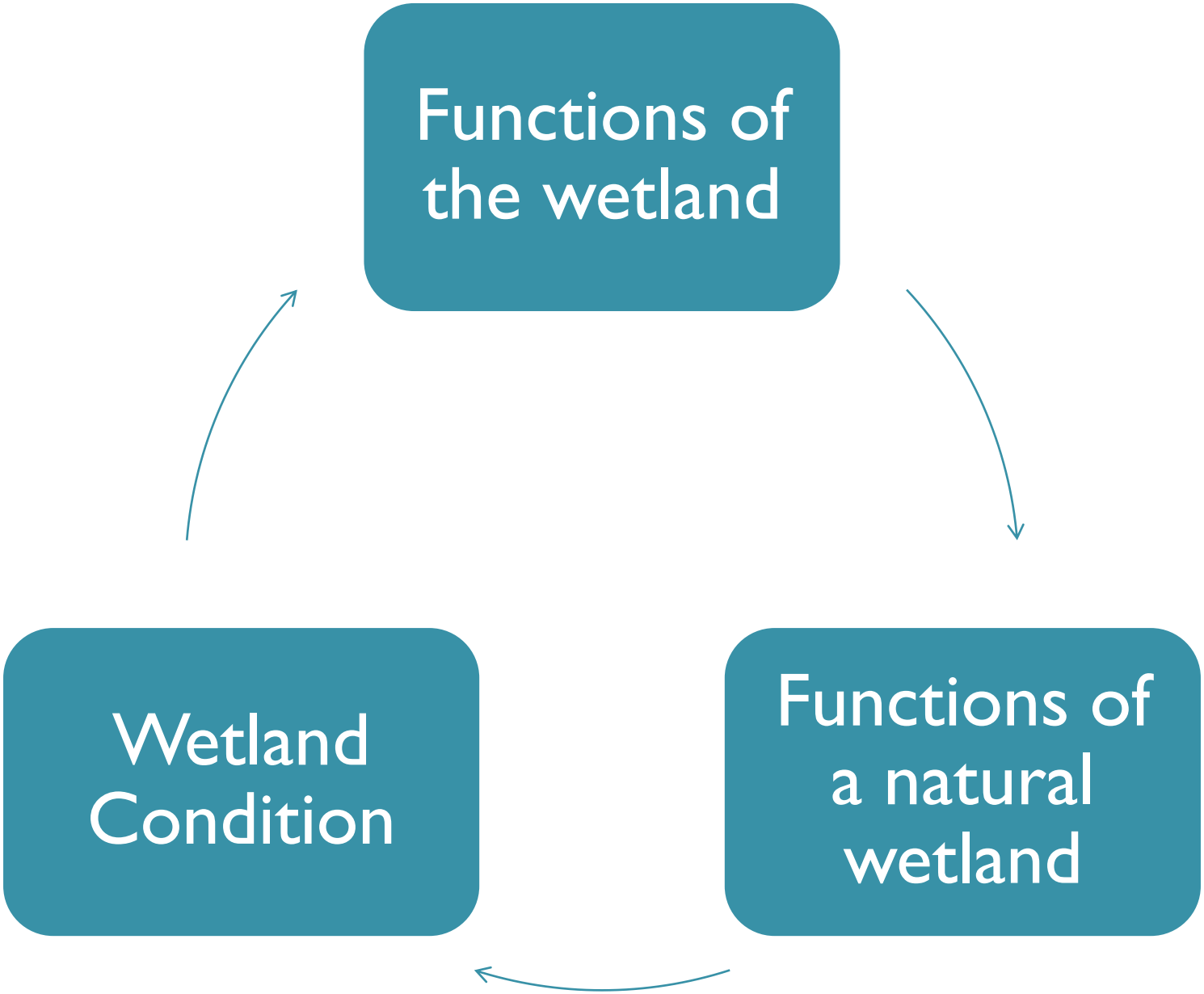
Wetland Condition

Evaluate the state of degradation in relation to a relatively undisturbed wetland.

So this wetland may be degraded, but it may be high functioning for storm water attenuation.

Is this high level of one function of enough value to offset other lost functions caused by degradation?

These are hard choices, so we often assume that a wetland in good condition provides a suite of functions that is appropriate and natural for wetlands in the area it is located.


Functions of the wetland
Functions of a natural wetland
Wetland Condition

Functional Assessment Methods

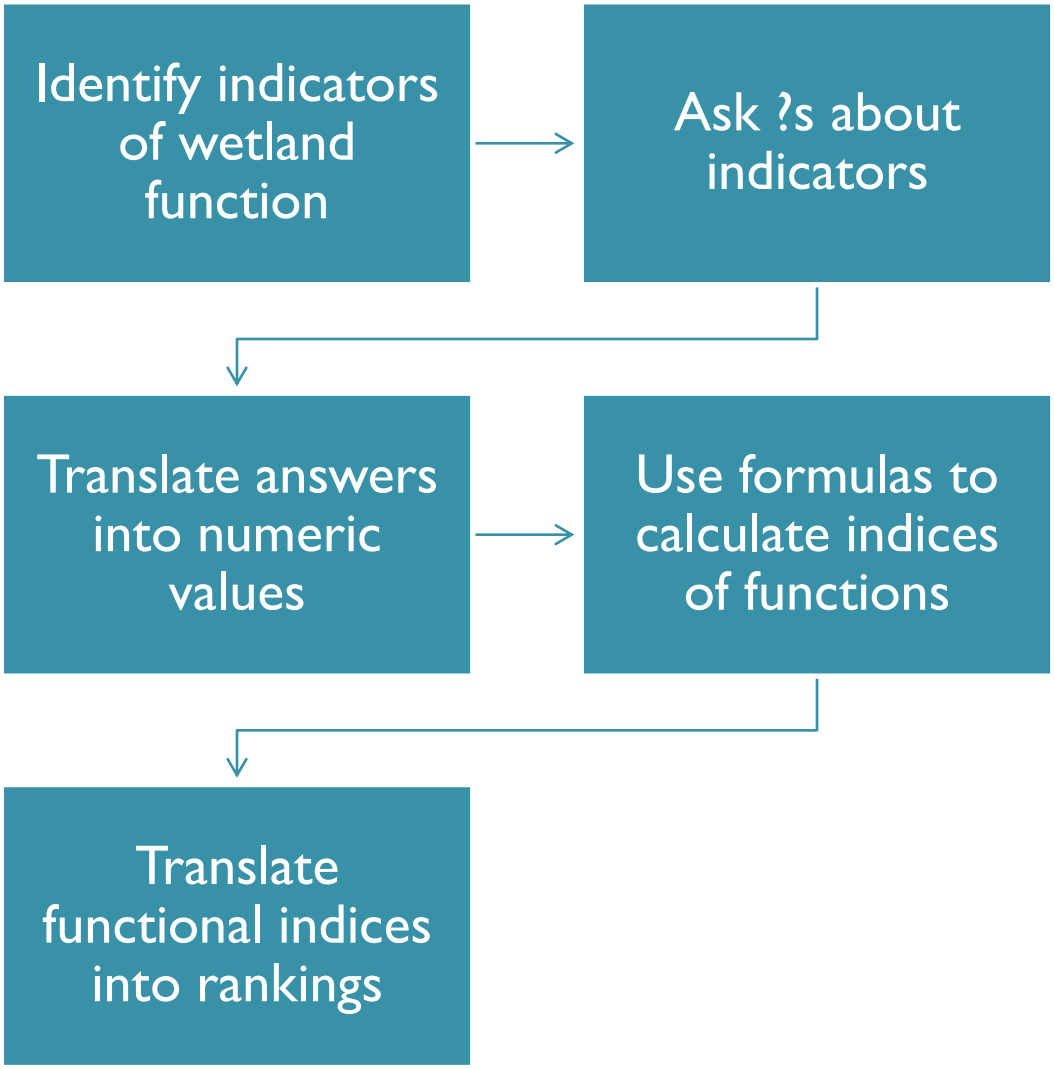
We don't measure wetland function directly.

We look at indicators of wetland function.

Indicators of Wetland Function

- Vegetation composition
- Surrounding land use
- Vegetation structure
- Inlet/outlet characteristics
- Soil texture
- Hydrologic source
- Runoff characteristics
- Etc., etc., etc., ……

Most methods:



Example

Density of vegetative cover of wetland?

Dense

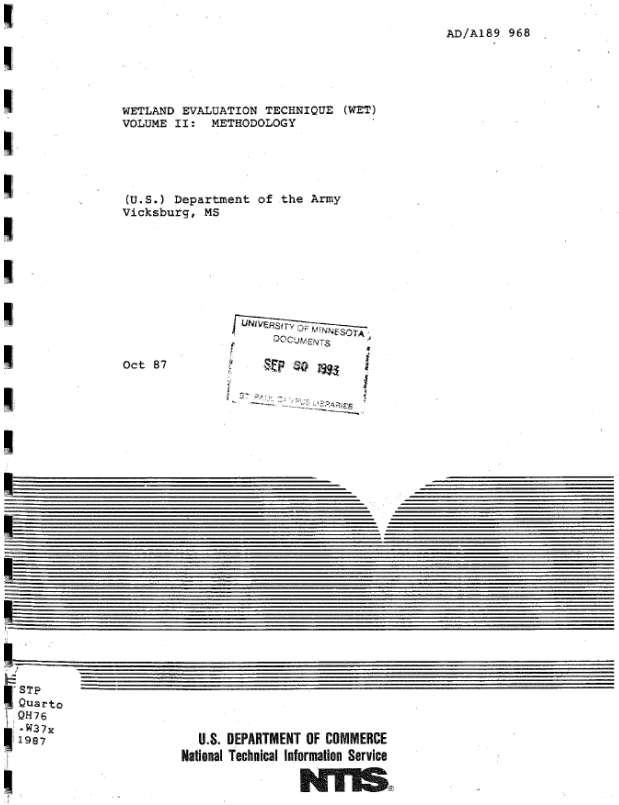
Sparse

Dense indicates good floodwater attenuation, sparse indicates poor attenuation.

Early Methods

Were designed to apply to large geographic areas and all wetland types

Wetland Evaluation Technique (WET)


AD/A189 968

WETLAND EVALUATION TECHNIQUE (WET)
VOLUME II: METHODOLOGY

(U.S.) Department of the Army
Vicksburg, MS

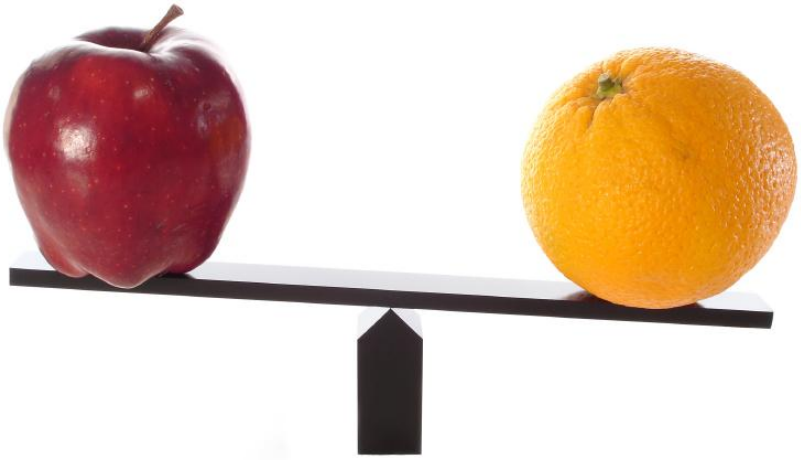
Oct 87

U.S. DEPARTMENT OF COMMERCE
National Technical Information Service
NTIS

89 pages of questions

Problems:

Lots of ??s



How can we reasonably compare totally different wetland types in different areas?

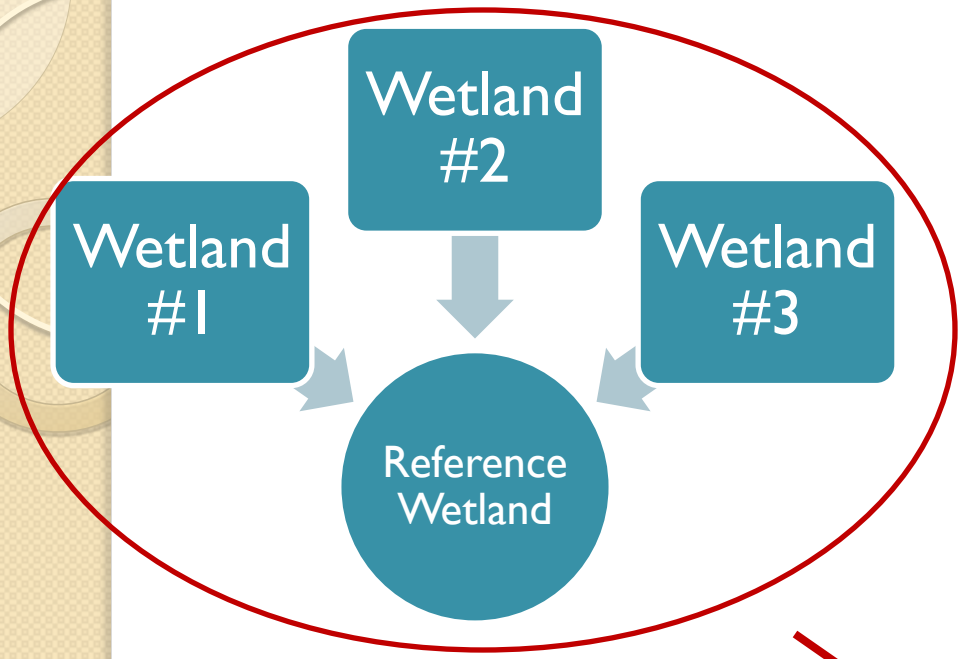
What if some wetland types in some areas are never able to achieve a high level of some function, even if they are pristine?

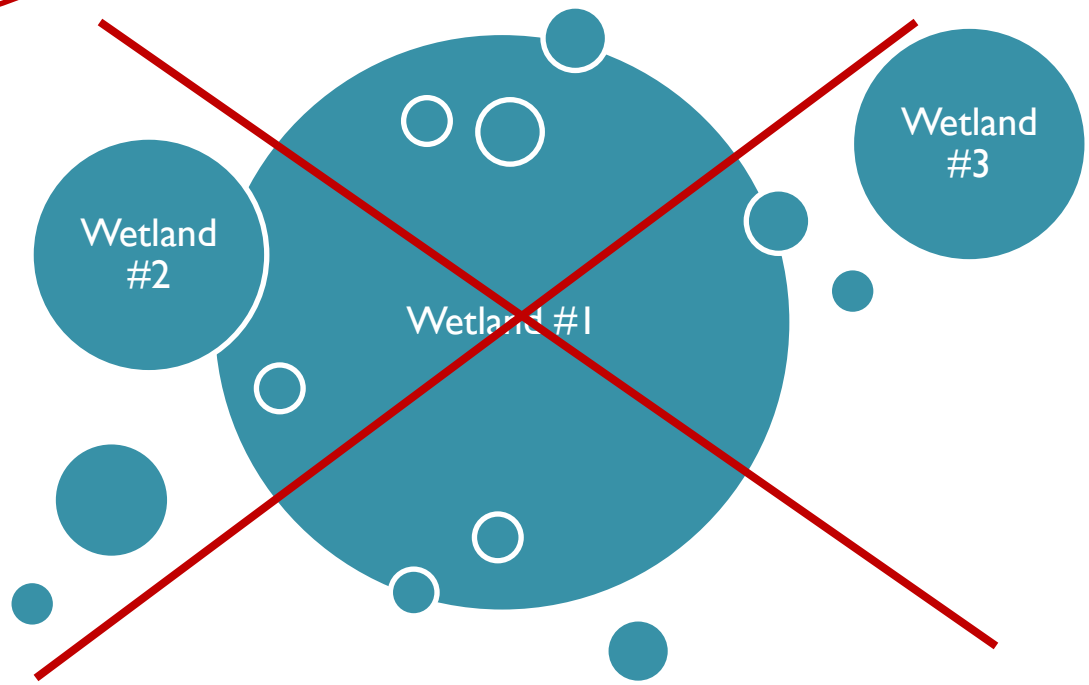
So along come new methods

- Rapid
- Adapted to smaller areas
- Concept of reference wetland

Reference Wetland

What is the functional level of the wetland you are evaluating in relation to the functional level of a similar, relatively undisturbed wetland?


Wetland #2
Wetland #1
Wetland #3
Reference Wetland


Wetland #3
Wetland #2
Wetland #1

But what do we mean by "similar" wetland?

Similar veg, similar hydrology, similar soil, what?

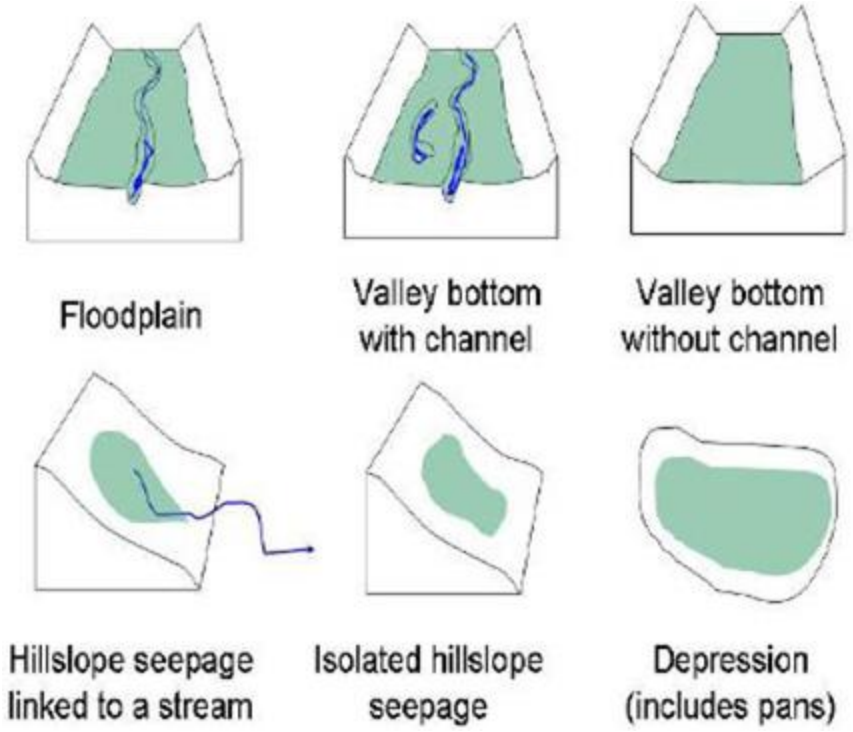
By what characteristics should we group wetlands to evaluate their functions?

Classifying Wetlands (grouping) by functional attributes

Hydrogeomorphic classification (HGM)

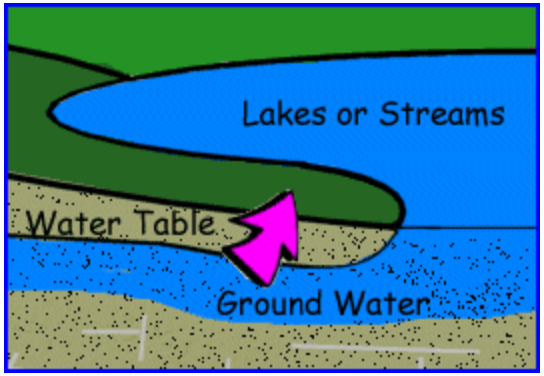
Wetland functioning is primarily influenced by its hydrologic source and its position in the landscape.

Landscape Positions



Flooding

Groundwater

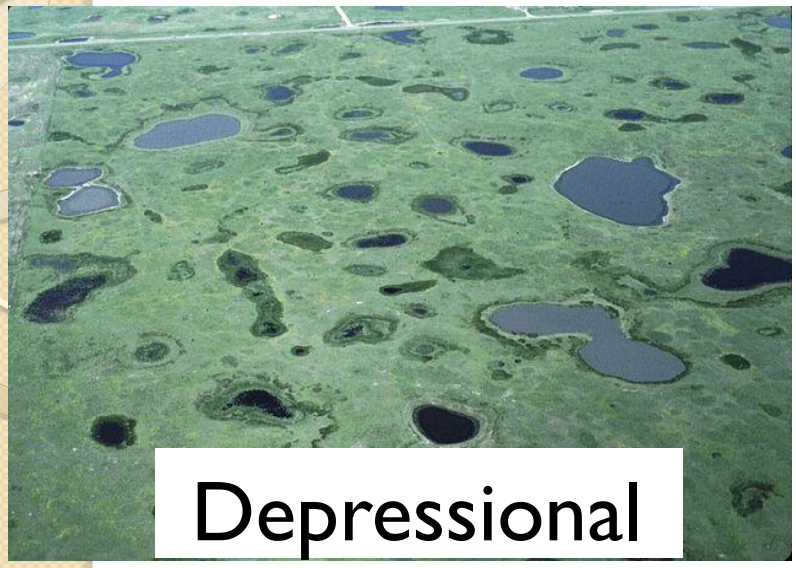


Surface water ponding

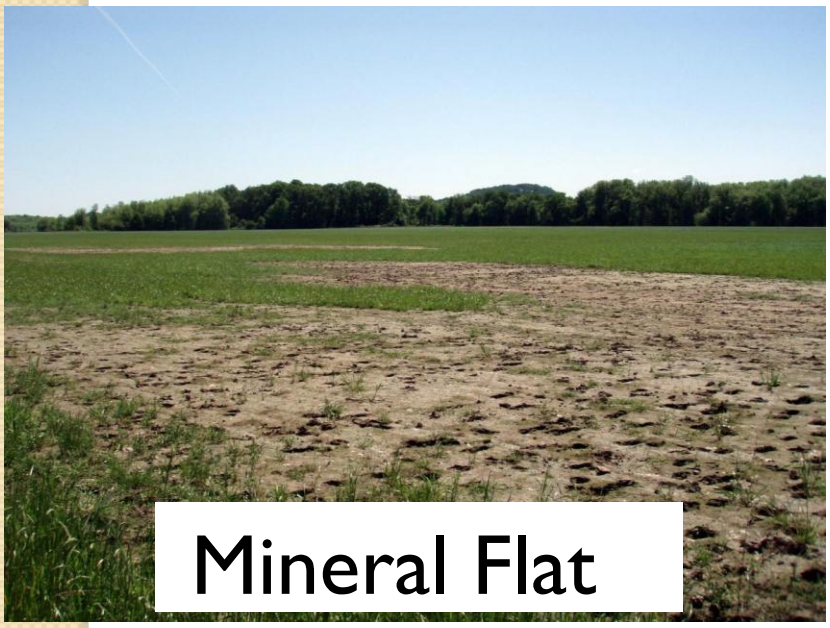
Slope Discharge

Most methods now follow some form of the "HGM approach"

- Wetlands grouped by HGM category
- Functions analyzed in relation to reference wetland within HGM category

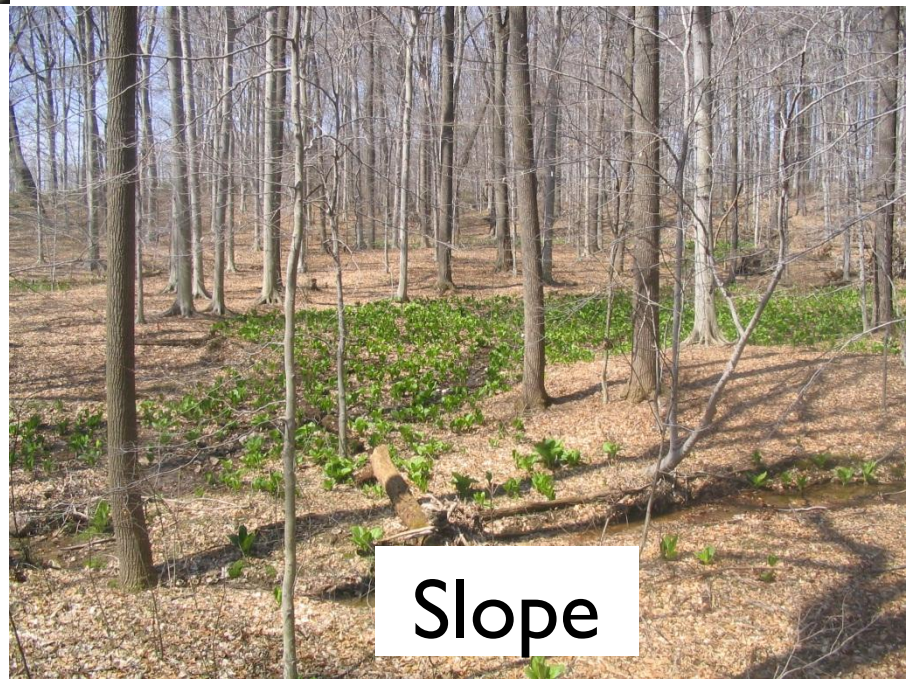

Depressional


Riverine


Mineral Flat


Organic Flat

Lacustrine Fringe



Slope

If the best of your seasonal wetlands look like this, then what's your reference?

The TEP needs to decide:

- What geographic area to consider
- What is a reasonable reference wetland condition for comparison

Real or Theoretical

Minnesota Functional Assessment Methods

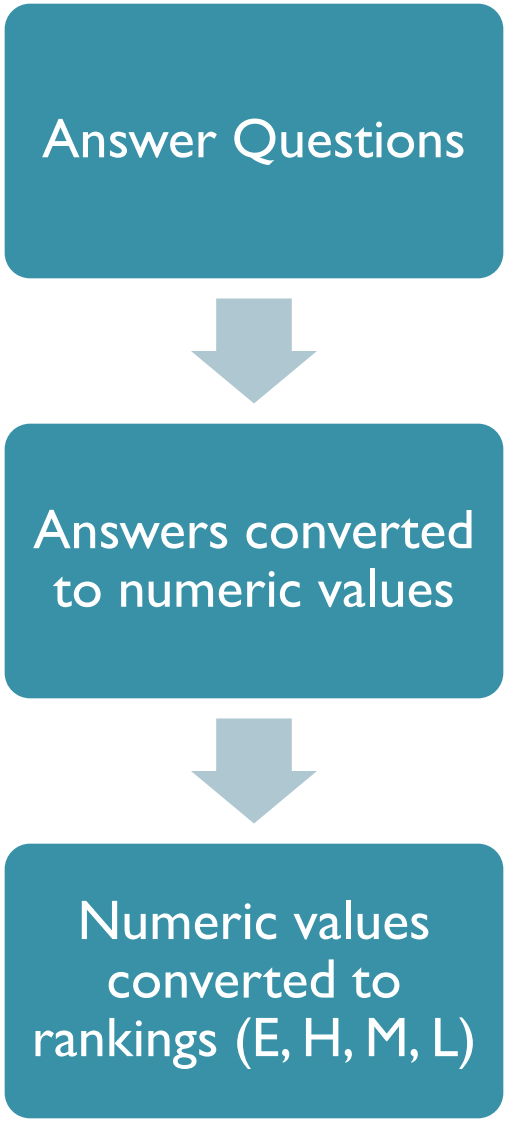
Must be BWSR-approved for WCA use.

- **Minnesota Routine Assessment Method (MnRAM)**
- **Hydrogeomorphic Approach to Assessing Wetland Functions for Prairie Potholes (HGM)**

MnRAM

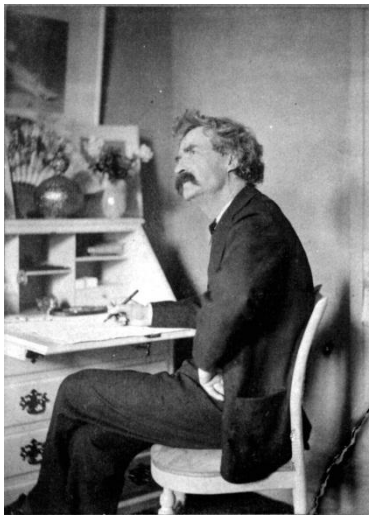
- Developed in 1990's
- Currently on 3rd Version
- Access database
- Now includes a management classification system for applying functional ratings to management

How it Works


Answer Questions
Answers converted to numeric values
Numeric values converted to rankings (E, H, M, L)

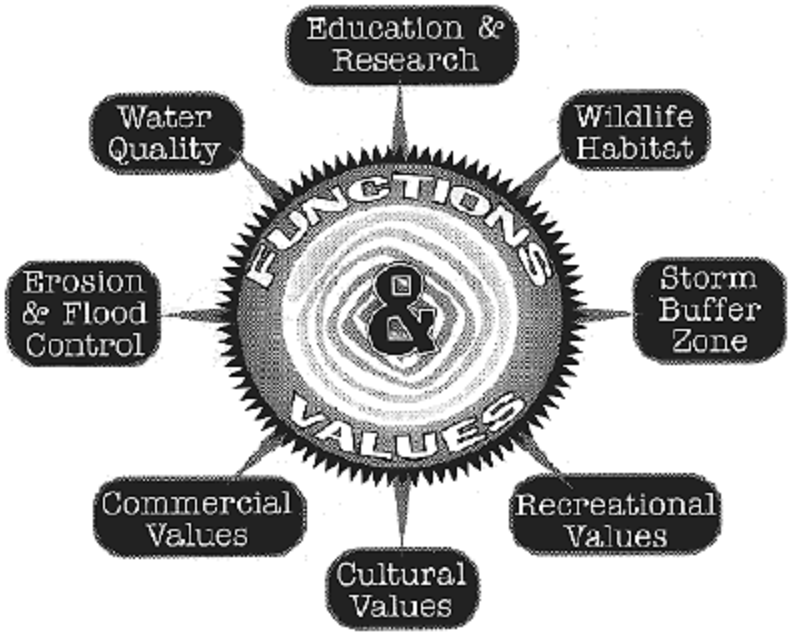
Caution

Answers to questions are not precise. Requires observational skills and professional judgment.



Caution

Do not combine wetland functional ratings for an overall score.



Time for some MnRAM

PART 2 – Using MnRAM in Regulatory Situations

Part 2 Outline

- Sequencing Flexibility and MnRAM
- Some other regulatory uses of MnRAM
- How to Review a MnRAM
- FQA condition assessment method

Sequencing Flexibility

What is it?

Flexibility in the *application of* the sequencing steps.

It does not mean that the steps can be skipped.

Sequencing Flexibility.

Flexibility:

- Threshold for meeting avoidance requirements is lowered.
- Threshold for meeting minimization requirements is lowered.

You could save this one, but why?

Wetland

Former dump site being cleaned up

Sequencing Flexibility Requirements Related to Functional Assessment

Proposed replacement wetland better than impacted wetland

Sequencing Flexibility Requirements Related to Functional Assessment

The wetland is degraded to the point where replacement would result in an almost certain gain in value.

"Degraded Wetland" is one that provides minimal function and value due to human activities.

What is "minimal function" and how much is a result of human activities?

Assessing if wetland is degraded:

Compare wetland to a reference wetland (real one or a perceived one) with similar hydrology and in a similar landscape position.

Are the functions minimal in comparison to the reference wetland?

If so, are they minimal because of human activities?

How to know if function is minimal due to human activities:

Consult MnRAM comprehensive guidance document

6.3 FLOOD AND STORMWATER STORAGE/ATTENUATION

and most importantly outlet configuration. Higher rated wetlands will have an unaltered or restricted outlet, undisturbed wetland soils, dense emergent vegetation without channels, a high proportion of impervious surfaces in the subwatershed, large runoff volumes, clayey upland soils, and few wetlands present within the subwatershed.

Will replacement wetland be better than degraded wetland?

Use MnRAM to predict function of replacement wetland? – NO.

MnRAM is not a good predictor of function and neither are the people using it.

In theory, if replacement standards are followed for restoration of a natural wetland, then we should be assured of a higher quality wetland!

- Natural hydrology restored
- Buffer requirements
- Native veg requirement
- Ecological suitability/consistency
- Etc.

Possible Exceptions

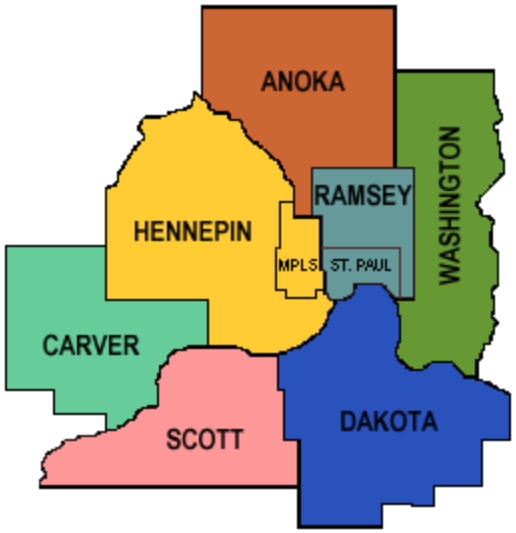
Unique wetlands

with unique, hard to replace functions

Checklist Example

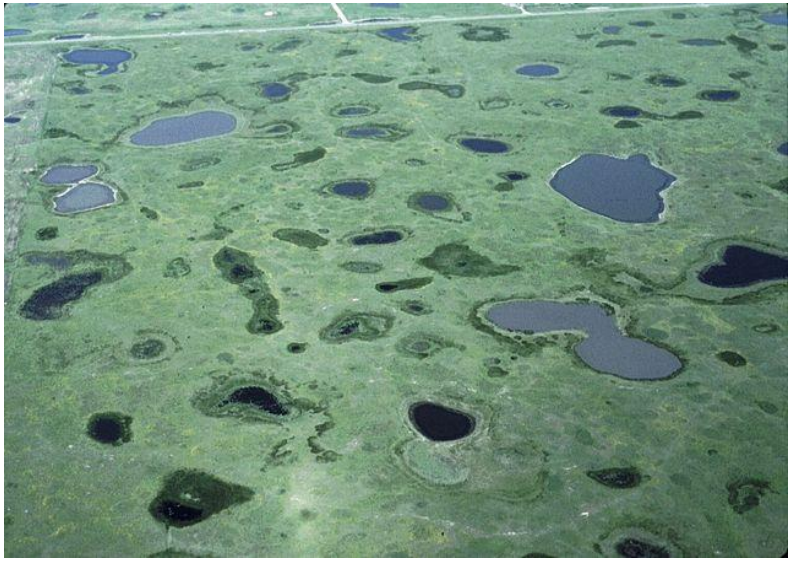
Checklist Example

Geographic area



Checklist Example

HGM Class



Depressional

Checklist Example

Reference Wetland

Checklist Example

Functional Comparison

Wildlife habitat, water quality protection functions minimal compared to reference wetland - Low MnRAM Scores

Checklist Example

Reduced functions due to humans?

Checklist Example

Rare or unique?

Checklist Example

Degraded wetland possibly eligible for sequencing flexibility.

What About Other Potential MnRAM Uses?

- No-Loss?
- Lower Replacement Ratio?
- Project-Specific Replacement Success?

NO..... Why?

Reason # 1

No-Loss and replacement ratios have specific requirements in rule. They are not intended to be overridden by functional assessments.

Reason # 2

MnRAM ain't that precise.

How about using MnRAM for replacement wetland standards?

Can be useful for vegetation success standards.

High Quality: Composed of 10 or more species of native/non-invasive grasses, sedges, ferns, rushes and/or forbs. Reed canary grass, purple loosestrife, stinging nettle and/or other invasive species (Table 1), if present, cumulatively comprise less than 20 percent cover. Non-native buckthorns absent or comprise less than 10 percent cover within the wet meadow community.

Medium Quality: Community composed of 5 to 9 species of native grasses, sedges, rushes, ferns and/or forbs; and/or invasive herbaceous species listed above cumulatively comprise 20 to 50 percent cover; and/or non-native buckthorns, comprise 10 to 30 percent cover within the wet meadow community.

Low Quality: Composed of 4 or fewer species of native grasses, sedges, rushes, ferns and/or forbs; and/or invasive herbaceous species listed above cumulatively comprise more than 50 percent cover; and/or non-native buckthorns comprise 30 to 50 percent cover within the wet meadow community. For example, this rating includes the nearly monotypic stands of reed canary grass that are commonly encountered.

How about using MnRAM for replacement wetland standards?

Difficult to use it for other functions because of imprecision.

1. **Outlet Characteristics**: Outlet characteristics
2. **Upland Watershed**: Upland land use, Upland soils,
3. **Wetland Condition/Land Use**: Wetland land use, sediment delivery
4. **Runoff Characteristics:** Stormwater runoff quality/quantity, subwatershed wetland density
5. **Surface Flow Characteristics**: Flow-through emergent vegetation density, surface flow characteristics

Flood and Stormwater Storage Index Computation:

Entire Formula: Outlet for flood retention{12} + (Dominant upland use{$14_{reversed}$}+ Upland soils{19})/2 + (Soil condition{15} + Sediment delivery{18})/2 + Stormwater runoff pretreat&det{20} + Subwatershed wetland density{21})/2 + (Percent emergent vegetative cover{16} + Flow-through emergent vegetative roughness{17} + Channels/sheet flow{22})/3)/5.

1. If 12=0, then: ($(14_{reversed}$ +19)/2+(15+18)/2+(20+21)/2+(16+17+22)/3)/4

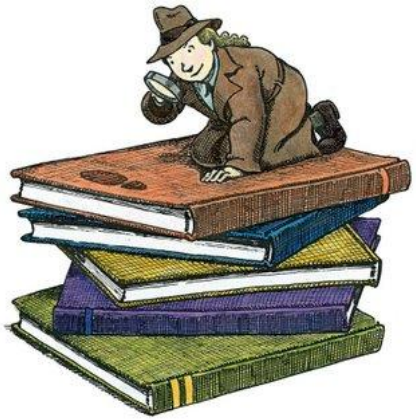
2. If 12>0, then: (12+($14_{reversed}$ +19)/2+(15+18)/2+(20+21)/2+(16+17+22)/3)/5

No changes to the formula are necessary if 16=0.

Flood and Stormwater Storage/Attenuation Variables

MnRAM #	Excel #	Variable Description	Type of Interaction
12	E16	Outlet—flood attenuation	Controlling—optional
14-R	F18	Dominant upland land use—reversed	Compensatory
19	E23	Upland soils	Compensatory
15	E19	Soil condition	Compensatory
18	E22	Sediment delivery	Compensatory
20	E24	Stormwater pretreatment &detention	Compensatory
21	E25	Subwatershed wetland density	Compensatory
16	F20	Emergent vegetation % cover	Comp.—optional
17	E21	Emergent vegetation flood resistance	Comp.—optional
22	E26	Channels/sheet flow	Compensatory

How do you review a MnRAM analysis done by someone else?

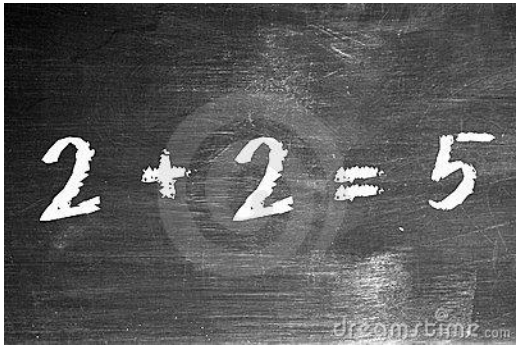


3 Levels of review

- Cursory
- Sample
- Detailed

Cursory Review

Does the outcome make intuitive sense?

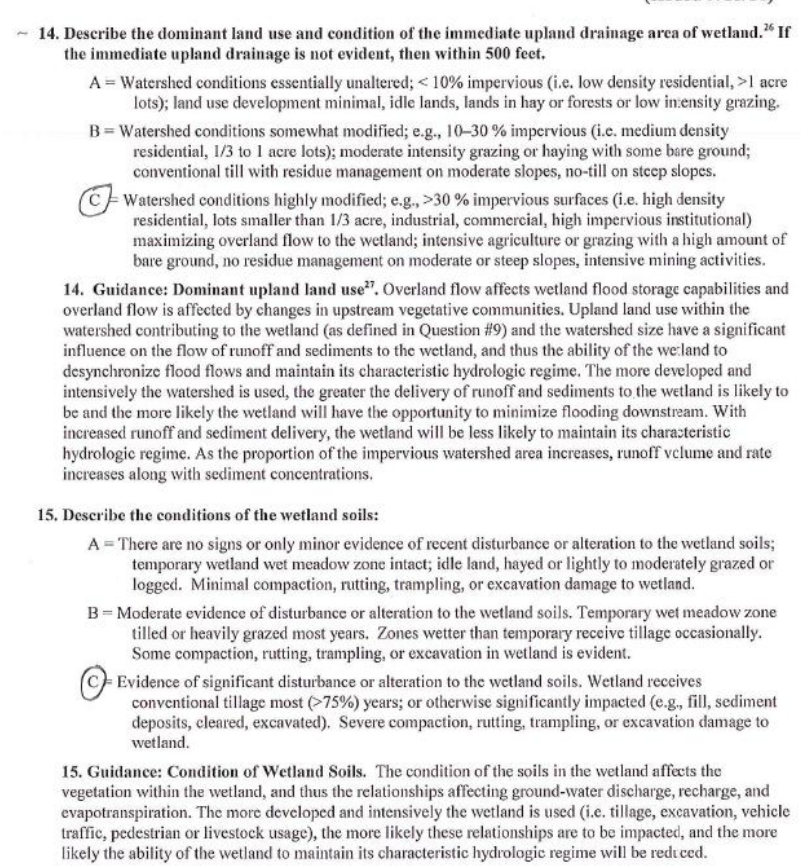


Is this wetland low quality to you?

Sample Review

Look at a sample of questions and how they were answered.

Consistent wrong answers may indicate inaccurate ratings.



(Issued 9/15/10)

~ **14. Describe the dominant land use and condition of the immediate upland drainage area of wetland.[26] If the immediate upland drainage is not evident, then within 500 feet.**

A = Watershed conditions essentially unaltered; < 10% impervious (i.e. low density residential, >1 acre lots); land use development minimal, idle lands, lands in hay or forests or low intensity grazing.

B = Watershed conditions somewhat modified; e.g., 10–30 % impervious (i.e. medium density residential, 1/3 to 1 acre lots); moderate intensity grazing or haying with some bare ground; conventional till with residue management on moderate slopes, no-till on steep slopes.

(C) = Watershed conditions highly modified; e.g., >30 % impervious surfaces (i.e. high density residential, lots smaller than 1/3 acre, industrial, commercial, high impervious institutional) maximizing overland flow to the wetland; intensive agriculture or grazing with a high amount of bare ground, no residue management on moderate or steep slopes, intensive mining activities.

14. Guidance: Dominant upland land use[27]. Overland flow affects wetland flood storage capabilities and overland flow is affected by changes in upstream vegetative communities. Upland land use within the watershed contributing to the wetland (as defined in Question #9) and the watershed size have a significant influence on the flow of runoff and sediments to the wetland, and thus the ability of the wetland to desynchronize flood flows and maintain its characteristic hydrologic regime. The more developed and intensively the watershed is used, the greater the delivery of runoff and sediments to the wetland is likely to be and the more likely the wetland will have the opportunity to minimize flooding downstream. With increased runoff and sediment delivery, the wetland will be less likely to maintain its characteristic hydrologic regime. As the proportion of the impervious watershed area increases, runoff volume and rate increases along with sediment concentrations.

15. Describe the conditions of the wetland soils:

A = There are no signs or only minor evidence of recent disturbance or alteration to the wetland soils; temporary wetland wet meadow zone intact; idle land, hayed or lightly to moderately grazed or logged. Minimal compaction, rutting, trampling, or excavation damage to wetland.

B = Moderate evidence of disturbance or alteration to the wetland soils. Temporary wet meadow zone tilled or heavily grazed most years. Zones wetter than temporary receive tillage occasionally. Some compaction, rutting, trampling, or excavation in wetland is evident.

(C) = Evidence of significant disturbance or alteration to the wetland soils. Wetland receives conventional tillage most (>75%) years; or otherwise significantly impacted (e.g., fill, sediment deposits, cleared, excavated). Severe compaction, rutting, trampling, or excavation damage to wetland.

15. Guidance: Condition of Wetland Soils. The condition of the soils in the wetland affects the vegetation within the wetland, and thus the relationships affecting ground-water discharge, recharge, and evapotranspiration. The more developed and intensively the wetland is used (i.e. tillage, excavation, vehicle traffic, pedestrian or livestock usage), the more likely these relationships are to be impacted, and the more likely the ability of the wetland to maintain its characteristic hydrologic regime will be reduced.

Sample Review

Which questions to look at?

Pick which functions are important for the review.

SUMMARY TABLE

ACTUAL CONDITIONS	FUNCTIONAL INDEX*		
FUNCTIONS (and Related Values)	N/A	Functional Index Score	Comments
Vegetative Diversity/Integrity** Plant Comm. #1			
Plant Comm. #2			
Plant Comm. #3			
Maintenance of Characteristic Hydrologic Regime			
Flood/Stormwater/Attenuation			
Downstream Water Quality			
Maintenance of Wetland Water Quality			
Shoreline Protection			
Maintenance of Characteristic Wildlife Habitat Structure			
Maintenance of Characteristic Fish Habitat			
Maintenance of Characteristic Amphibian Habitat			
Aesthetics/Recreation/Education/Cultural			
Commercial Uses			
Groundwater Interaction			
Additional Information			
Wetland Restoration Potential			
Sensitivity to Stormwater and Urban Development			
Additional Stormwater Treatment Needs			

Sample Review

Look at comprehensive guidance document for which questions are relevant for the rating of those functions.

Downstream Water Quality Variables

MnRAM #	Excel #	Variable Description	Type of Interaction
14	E18	Dominant upland land use	Controlling
20	E24	Stormwater runoff pretreatment & detention	Controlling
18	E22	Sediment delivery	Controlling
23	G27	Upland buffer width—water quality valuation	Comp.
24	G28	Upland area management	Comp.
26	G34	Upland area slope	Comp.
16	F20	Emergent vegetation (% cover)	Comp.—optional
17	E21	Emergent vegetation (roughness coefficient)	Comp.—optional
27	E39	Downstream sensitivity	Comp.
12	E16	Outlet for flood	Controlling--optional

Wildlife Variables

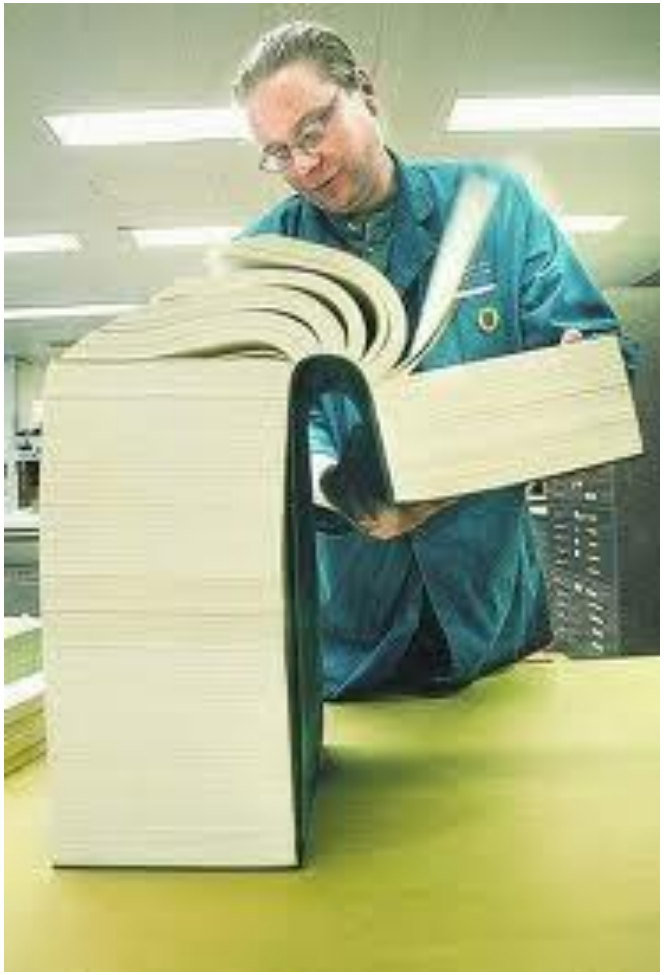
MnRAM #	Excel #	Variable Description	Type of Interaction
41	E53	Wildlife barriers	Controlling
3e	D6	Vegetative Ranking (communities' weighted average)	Compensatory
39	E51	Wetland detritus (n/a)	Contributing
23	I27	Upland buffer average width—wildlife valuation	Contributing
24	G28	Upland area management	Contributing
25	G31	Upland area diversity	Contributing
13	E17	Outlet natural hydrologic regime	Contributing
20 R	F24	Stormwater runoff pretreatment & detention—reversed	Contributing
37	F49	Vegetation interspersion (n/a)	Contributing
38	F50	Community interspersion (n/a)	Contributing
40	E52	Wetland interspersion	Contributing

Sample Review

If inaccuracies found, then have them re-run the analysis using corrected answers.

Detailed Review

Review all of the answers.



Which review to use?

It depends?

- Is the MnRAM just documenting what is obvious to the TEP/LGU?
- Is the MnRAM review a key to the application review?

Use common sense

Floristic Quality Assessment

It is a condition assessment method.

Measures the deviation of a wetland from its "natural state" (lack of human disturbance)

Floristic Quality Assessment

Plant species have varying degrees of tolerance to disturbance.

Floristic Quality Assessment

The Concept:

The more species (as a percent of the whole) with a low tolerance for disturbance, the better the wetland condition.

Floristic Quality Index (FQI) can be calculated based on this concept.

The Coefficient of Conservatism (*C*)

- Reflects the fidelity of a species to natural undisturbed habitats (0-10)

Box Elder

C = 1

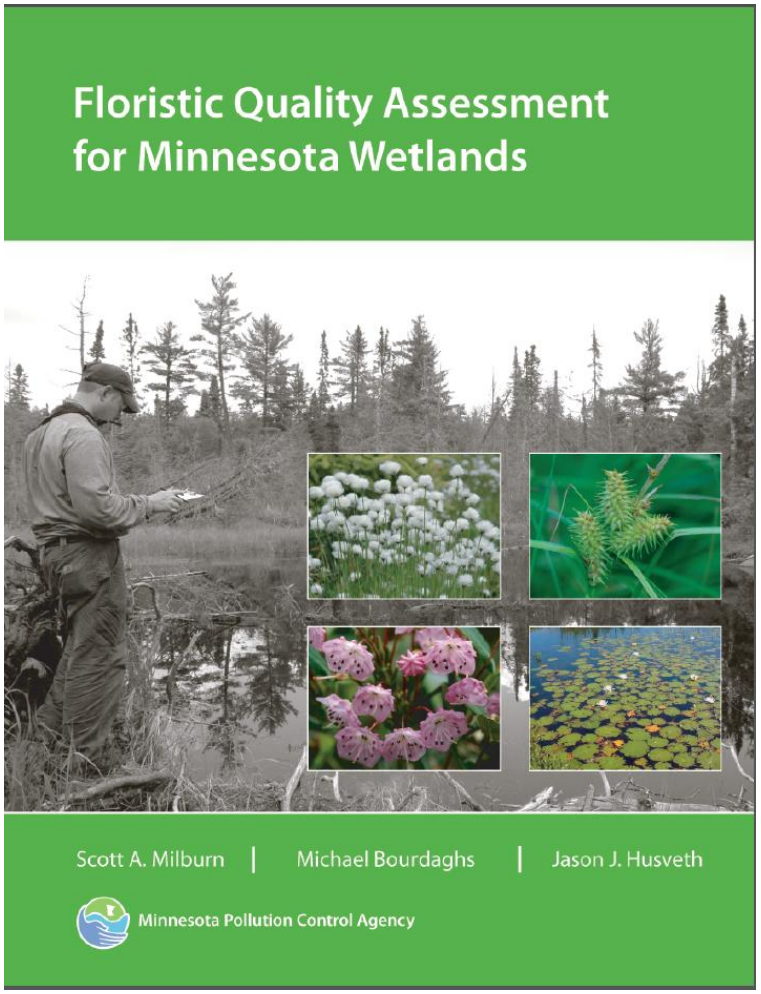
(Lake sedge)

C = 5

Small White Lady's Slipper

C = 10

C-values published in 2007



Sampling Approach

Standard Approach – Identify all species and calculate weighted C value

Rapid FQA Project (2008-12)

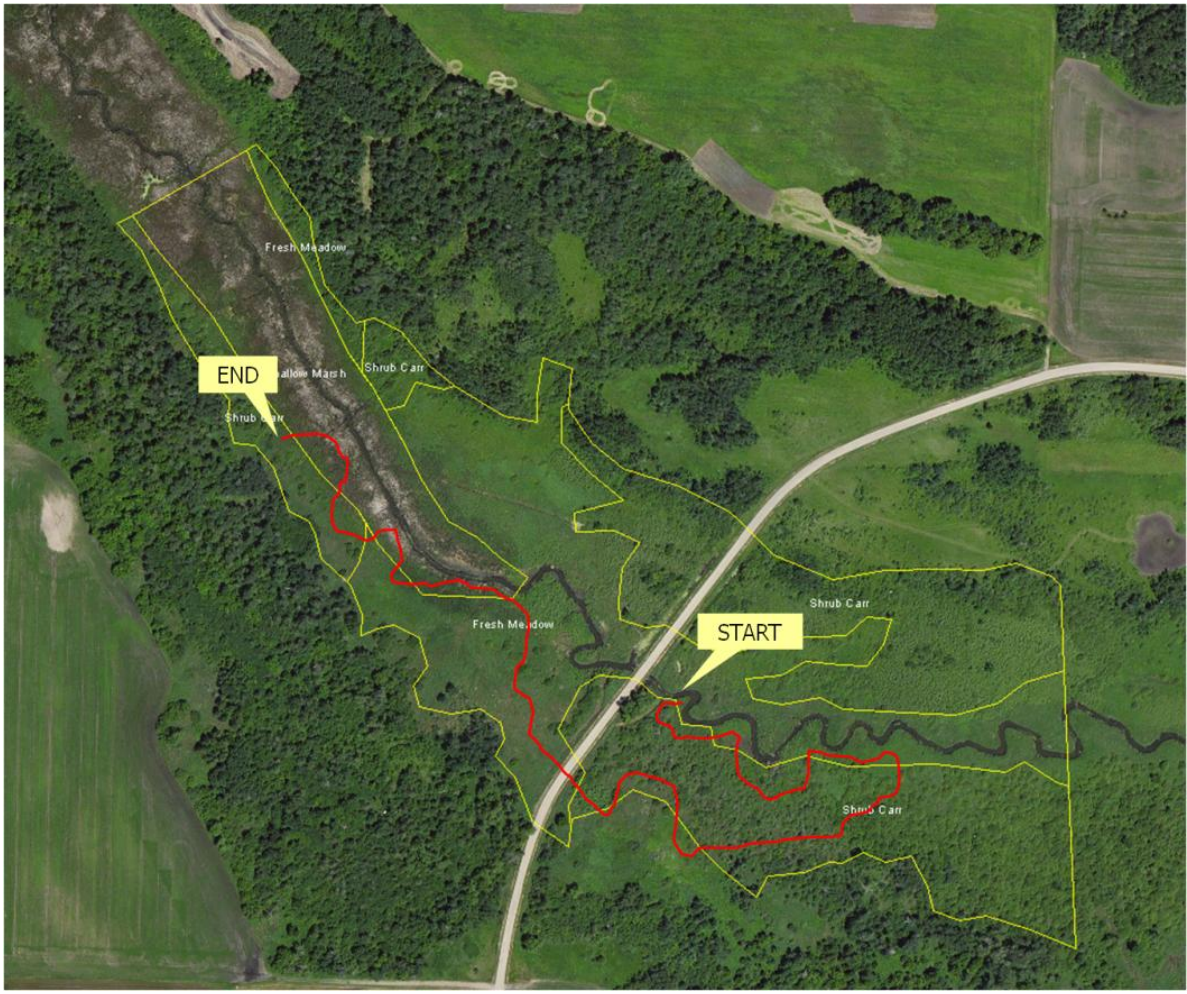
'Rapid' sampling approach that focuses on common/easily ID'd species

Target user = Natural resource professional with moderate botanical expertise

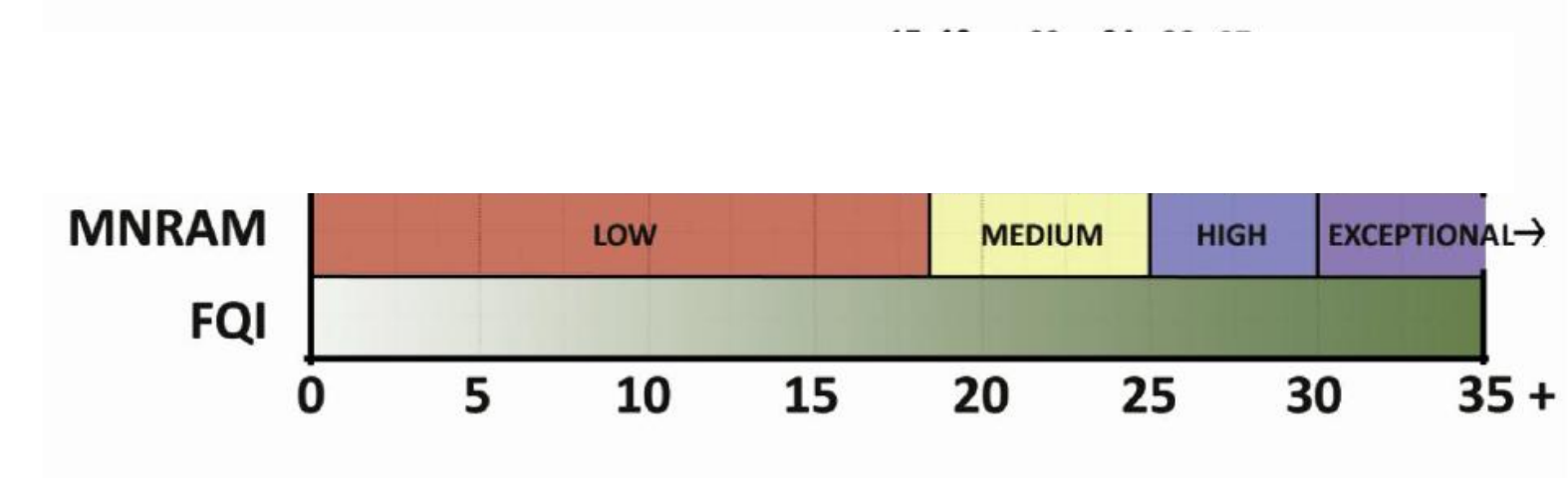
Rapid FQA Sampling

Timed meander

Species presence & cover class recorded by community type
Limited to the most common/easier to ID spp.

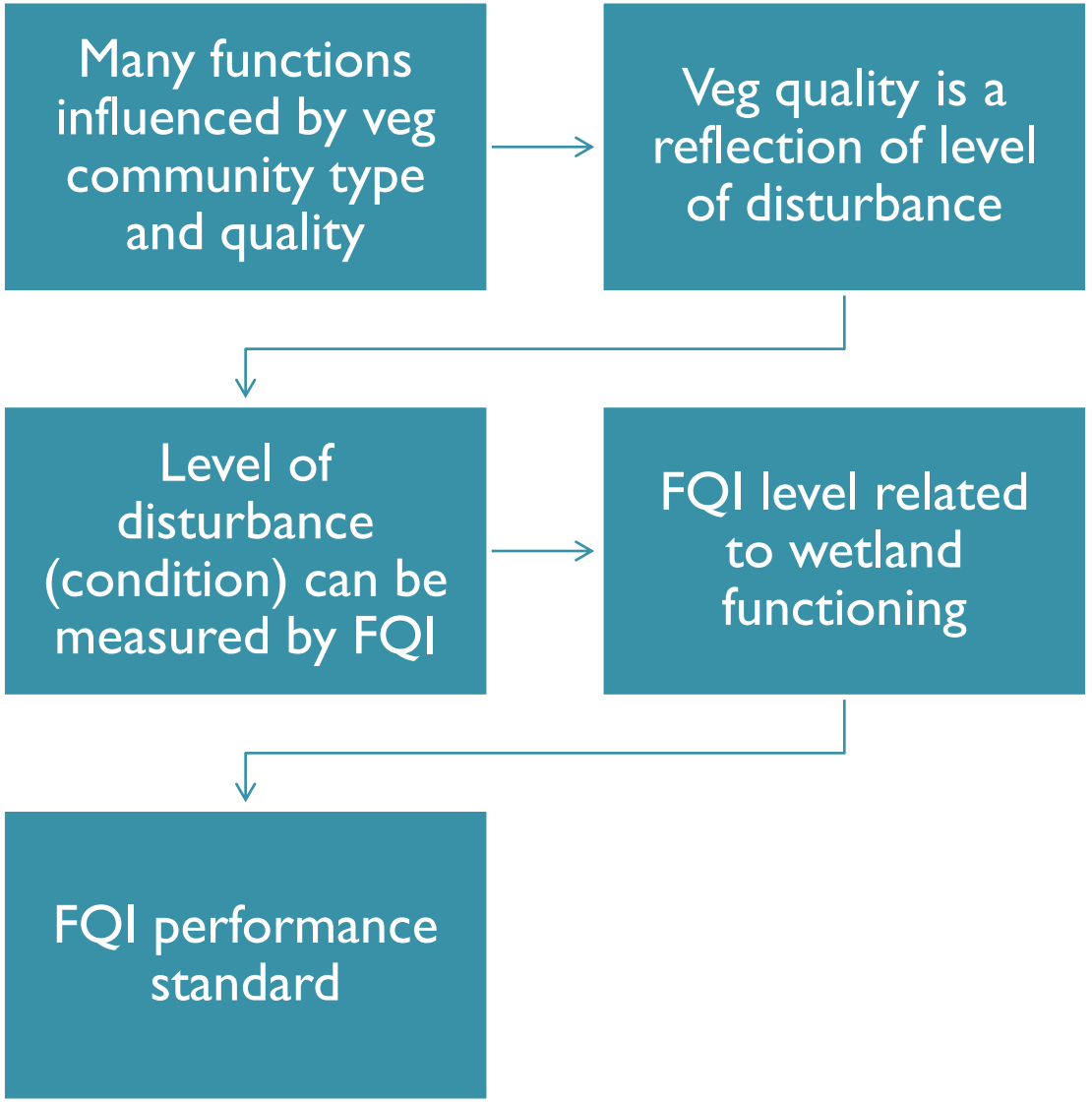


Using FQI for Performance Standards – An Example



Example for wet meadows – created by Jason Husveth of Critical Connections

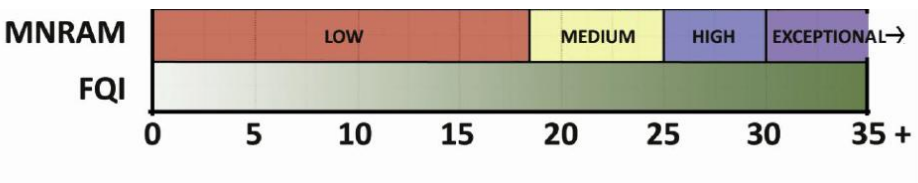
The Logic

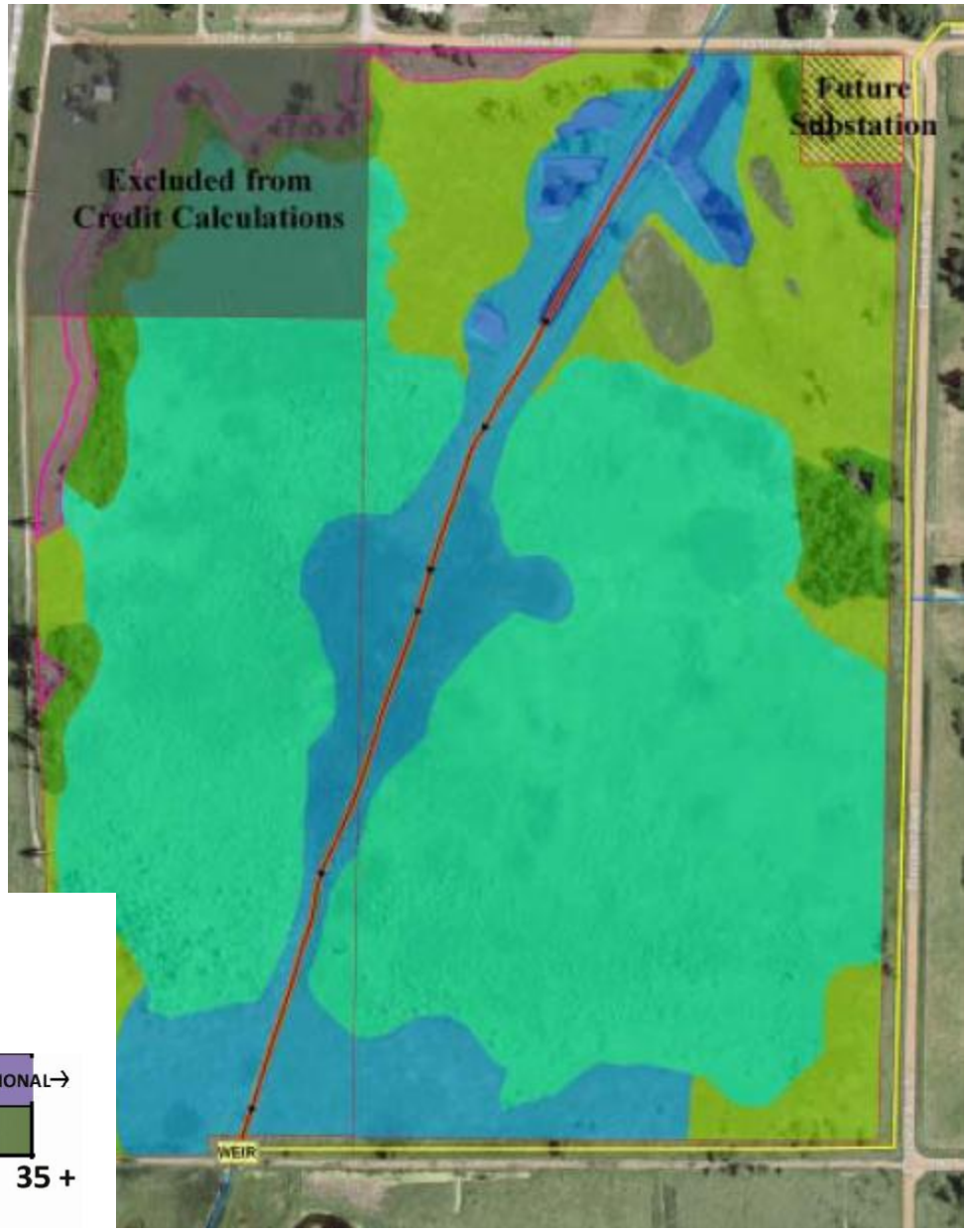

Many functions influenced by veg community type and quality
Veg quality is a reflection of level of disturbance
Level of disturbance (condition) can be measured by FQI
FQI level related to wetland functioning
FQI performance standard

FQI 18 – 50% credit

FQI 25 – 75% credit

FQI 30 – 100% credit





The end of the line

The end of the road

The end of the earth